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# ADDRESSES BY CITIZENS TO SCHOOL BOYS.—*Concluded*

## PHYSICAL CULTURE

R. M. SIMPSON, M.D.
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The object of physical culture, as applied to you young people, is to develop your bodies in such a way as to bring them into that condition which we know as most favorable for perfect health. Just as the general education you get in school is not designed to fit you for any particular walk of life, so the object of these exercises is not to train you to do any special feats of strength or agility, but to produce healthy, symmetrical bodies; and this symmetry, if you think a moment, really means the same thing as beauty.

Before going into any special profession or occupation, the wisest thing for you to do is, of course, to get a good, sound, general education as a foundation, and if any of you wish to go into any particular line of athletics with a view to excelling in it, you should not do so until all your muscles have been evenly developed and growth has practically been completed.

For anyone to lay down a set of rules for physical exercises and intelligently apply them it is plain that he should have some knowledge of the structure of the human body and of its functions; that is, he should know some anatomy and some physiology. The same is also true of you, if you are rightly to understand and appreciate the value of these exercises.

Each of your bodies has, as you know, a strong framework made of bones, and these bones are joined together by tough membranes and bands called ligaments, these often being arranged so that between two adjoining bones there is a hinge-like movement possible. Outside these bones and attached to them are the muscles which make up the greater part of the bulk of our bodies. These muscles are generally spindle shape in form and are able to shorten in one direction, and it is by this property we are able to move; and even when we are not moving they, by having a certain tone, support the different parts of the body. Outside these muscles is the tough skin that serves a very important purpose in protecting our other tissues.

There is, besides, the little muscular pump, called the heart, that pumps the blood to every part of our anatomy, and this blood carries with it certain substances to feed and nourish our bodies, which substances it picks up from the digestive tract and the lungs.

Then there is the most wonderful part of all, the nervous system, which rules the whole body and which may be compared to an electric battery, which is the brain, and from this battery run little tubes or fibers, to all parts of our bodies. When we wish to move an arm, from our brain goes an impulse down one or more of these little nerves and certain muscles shorten and the limb moves.

This is, of course, a very crude description, but perhaps it will help you to understand better what I am going to tell you. To begin with, Nature has made a law that all the muscles or organs of our bodies must be exercised or used if they are to remain normal and healthy; so that if you bandage up an arm in such a way as to prevent movement, even for a few weeks, you will find when you remove these bandages that it is much smaller and weaker than its fellow, because the muscles have wasted away from non-use. And the same thing occurs over a large part of the body if the patient is simply put to bed and kept from exercise. Even higher organs than muscles come under the same rule. I am sure most of you have heard of the little fish in the great cave of Kentucky. These fish have become totally blind because they have lived for generations in perfect darkness, and as they could not use their eyes they gradually became quite sightless.

Now that very young children and animals may get this needful exercise, there is implanted in them a desire for play, and that they may not do this to excess, Nature has provided that when they have had enough they get tired and want to rest or sleep. From this a very useful lesson can be learned, for, especially when we are growing, we should not indulge in any muscular effort to excess, but should heed the warning that comes to us from feeling tired. If by will power we force our muscles to do too much work, they may not become sufficiently refreshed during the next period of rest to be in the best possible condition when required for use again.

The wise Mother Nature has also arranged that if a muscle or group of muscles is used more than others, that is, within reasonable bounds, it gradually increases in size and strength. This is a very fortunate thing, for you know how necessary strong arms are to a blacksmith and strong legs to a soldier. These changes come very gradually, and this is a very important thing to remember, for Nature needs time to increase the size and number of the muscle cells. If a boy wishes to do any feat, such as running a certain distance or throwing a weight, the proper way is to fit himself by gradually increasing exercise for it. This seems to have been known to people long ago, for you have read of the famous athlete who commenced to lift the calf every day until finally he was able to lift it even when it had become a full grown ox.

Here I would like to again impress on you these simple facts:

1. That a muscle must be regularly exercised to keep up its strength and condition of health.

2. That if a muscle or group of muscles is exercised so that gradually more and more work is imposed on it, and ample intervals allowed for rest, it will increase in power, often to a wonderful extent.

3. That if, on the other hand, it has too great a task imposed on it, and is not given sufficient rest, it may become chronically tired and even weaker.

Sometimes a boy or girl, by getting into careless habits, may not give certain of his or her muscles a chance to develop; for instance, if he sits continually in an improper position, he may not exercise certain of the muscles of his chest properly and these may become weaker than those that are used, and this may go so far as to interfere with the proper expansion of the chest, a very important thing; or some of these muscles that support the spinal column may be affected in the same way and you may even get a deformity which may be very hard to cure. The same thing applies to all the muscles of the body, and it is the part of the instructor to pick out these defects and decide the proper exercises for their correction.

Another result obtained from proper physical exercises is the education of the nervous system. You all know how difficult it is to do even simple things, such as drawing a straight line or sharpening a lead pencil, when you try it for the first time. This is because the little paths or tubes through the nervous system are not used to carry the impulse to the particular muscles, but after you practice these actions for a time they soon become easy, and then so that you hardly know that you are doing them; that is, automatic, all because the nerve paths have been educated, or perhaps, as some think, new ones formed. So you see these exercises may be of use in training you to precise and graceful movement.

One thing I would like to leave clearly impressed on you, even though by doing so I may be wandering away from the exact subject of this talk, and that is the very serious injury you may do yourselves from excess in your sports and games.

This damage falls particularly on the circulatory system, which consists as you know of the heart and blood vessels, and whose function is to carry the nutrient blood to all parts of our bodies. The heart is nothing more than a little pump whose walls are a peculiar kind of muscle, but which obeys the same laws as those we mentioned in connection with the skeletal muscles. That is, if it is given extra work to do over a considerable period, the muscular wall thickens and it becomes much more powerful and pumps the blood along with greater ease. This is why athletes who are in training feel so well and are able to run great distances or play long, hard games without being exhausted. A Marathon runner who would be in perfect condition would have the muscles of his legs well developed and firm, and, more important, his heart developed so that it would keep pumping the blood more rapidly through the lungs and tissues of the body. If this were not so, he would soon fall exhausted.

This desired condition he brings himself into by daily practice, gradually increasing the distance until he is equal to the task of running the whole odd twenty-five miles. Now if he were to force himself to run this great distance without any preparation, what would likely happen would be that the muscular wall of his heart, not being gradually prepared for the prolonged strain, would weaken and stretch and the cavity of the heart be dilated, with the result that the runner might even die or at least damage himself very seriously. And this is exactly what often happens to boys who play hard games of hockey or lacrosse without proper preparation.

And it is not only the heart that may suffer from excessive or irregular strain, but these elastic tubes, the arteries, and especially the large one next the heart may be damaged. So that it is not uncommon for porters and others who have to lift great weights at irregular intervals to have the walls of this artery give way, forming a little sac or pouch which grows and which often, by rupturing, causes sudden death; or the wall may not be so seriously damaged and the effects may be noticed only later on in life.

While training and getting into condition within reasonable bounds is not a bad thing, it is to be remembered that if a boy has been playing lacrosse or football all season he should not stop exercise suddenly, but as he should prepare himself gradually, so he should also gradually diminish his exercise. The reason of this is that his heart wall has become thicker and stronger during his training by the muscle cells becoming larger and perhaps more numerous. When he gives up his sport he has no use for the extra muscle, and Nature, as we said above, always adapts a muscle, even the heart, to the amount of work required of it, so that these heart muscles return to their normal size. And if this is allowed to occur too quickly the heart may become temporarily weaker than normal while these changes are going on, and harm may be done. In fact, every doctor sees such a case now and then.

In a little talk like this it is of course impossible to tell you many things I would like to, but if I have succeeded in exciting your interest in your own bodies I will be very much pleased; and I am sure you will be able to get any special information from your teachers. You will also, I hope, take more interest in the instruction given you in physiology, for what can be more important for a man or woman than to know all about his or her body and how to care for it?

## THE TRAINING OF AN ELECTRICAL EXPERT

PROFESSOR E. P. FETHERSTONHAUGH
University of Manitoba

I am here today to tell you something about electricity and the electrical industry and also to talk to you about the education that a man must have if he is to become an expert in this line of work. At the age you have now reached you should be beginning to plan your training for some branch of work, and I must impress on you the necessity of taking advantage of every opportunity in the way of education that is available, no matter what kind of work you are going in for. In these days of strenuous competition it is only the man with the highest qualifications who can reach the highest positions. In electrical work there are many such positions to be had, and, if we look forward to the future of this Province with its magnificent water powers and the many systems of electrical railways, city lighting, power plants, and industries to be operated by electricity, we cannot fail to realize that a high degree of training will be required by the men who are to occupy the best positions in these industries.

In order that you may have some definite idea of what electricity can be made to do, I have brought with me some simple pieces of apparatus which can be made by any boy at home, and which illustrate the fundamental principles of electrical science. I will first show you how an electric battery can be made. If you take a glass jar about the size of this one I have, and place in it six ounces of sal-ammoniac, and then fill it about two-thirds full of water, and place in it a piece of carbon and a piece of zinc, you have a simple electric battery, and if you take two wires and connect one to the zinc and the other to the carbon and touch them together, a current of electricity will flow through them. This current may be made stronger by connecting two cells together, that is, connecting the carbon of one to the zinc of the other, and then connecting the outside carbon and zinc to whatever you are going to use the electricity on.

Now let us see what we can do with this current that we have available. You will notice that this needle, which is a piece of hard steel which has been magnetized, always points in one direction, that is, toward the north pole. This is because the earth is a magnet and the north pole of the earth attracts one end of this needle, and the south pole attracts the other. The end of the magnet which points toward the north pole is called the north pole of the magnet and the other end is called the south pole. This needle is a permanent magnet, but we can also make magnets which are not permanent, these being made from soft iron instead of steel. If I take this coil, which consists of 200 turns of insulated copper wire, and place it around this U-shaped piece of soft iron, and then send a current of electricity from the battery through the coil, the U-shaped iron will become a magnet and you will see that it can lift a piece of iron of considerable size. If I disconnect it from the battery it loses its magnetism immediately and the piece of iron will fall. This is called an electro-magnet. One of its ends will be a north pole and the other a south pole; but if I connect the coil to the battery in the reverse direction so that the current flows in the opposite direction around the magnet, the end which was previously a north pole now becomes a south pole. A north pole of one magnet will attract a south pole of another magnet and will repel a north pole of another magnet and it is on this principle that all electric motors are operated. An electric motor in its simplest form consists of two magnets, one of which is always magnetized in the same direction and is called a field magnet, and another which is arranged to revolve between the ends of the field magnet and has an arrangement called a commutator which, as it revolves, changes the direction of the current passing through its winding in such a way that just as its north pole has reached a south pole of the field magnet, the polarity is reversed and therefore the south pole of the field magnet repels the south pole of the revolving magnet, or armature as it is called, and thus it is made to revolve continuously. A motor built on this principle can be made very powerful and will drive machinery by connecting its shaft directly to the machine to be driven or by means of a pulley and belt.

A peculiar fact about this machine is that if it is driven by some outside force, for instance if you revolve it by hand, it would generate or produce a current of electricity. So you see a dynamo or generator is just the same machine as a motor, the only difference being that the motor is supplied with electricity and produces mechanical power and the generator is supplied with mechanical power and produces electricity. It would be too expensive to generate electricity for large lighting systems by means of batteries such as I have described above and consequently we get all our electricity from these machines called generators, which are driven either by steam engines, by hydraulic turbines, or by gas engines. In the electric plants at Lac du Bonnet and at

Point du Bois, from which we get our city supply of electricity, very large generators of thousands of horse-power capacity are used and as the voltage which these generators supply is very high, and the mechanism by which the current is conducted from the generators to the transformers and from the transformers to the transmission line is very intricate and complicated, and since the one essential in a plant such as this serving a large community is to avoid a shut-down or interruption to the service, you will realize the necessity for having such plants designed by very competent experts and operated by highly skilled engineers. The same applies to motors in machine shops and to all sorts of electrical machinery on which our various industries depend, and if you are thinking of going in for electrical work the question is "How is the necessary knowledge to be obtained?" In answer to this my first advice would be to stay at school until you have finished your school course and taken every advantage that the schools in our city are now so well able to afford. The next step would be to take a course in electrical engineering at a university if this is possible, as such a training affords the best opportunities for getting a knowledge of all the underlying principles forming the foundation of this profession. If you cannot take a university course you can enter the services of some electrical company and learn by experience a great many of the practical applications of electrical principles, and if you study at home and take advantage of night classes and read the technical papers you can acquire a very fair knowledge of the subject, but let me impress upon you the fact that whether you gain your knowledge through a university course or through the school of experience, it is only by hard work and continuous study that you can become an expert in electrical work.

## THE POSSIBILITIES FOR SUCCESS IN RAILWAY WORK

GEORGE BURY
Vice-President and General Manager of Canadian Pacific Railway

Ordinarily, every boy is fitted to attain success in some walk of life. Before deciding on his life work, a boy should endeavor to learn for himself what thing he is best adapted for and then follow that line. Should he feel that his future lies in railway work there are many avenues he might enter and follow to success.

Before entering the service of the railway, a boy should have a good common school education, and if he determines to be successful, he should, at the outset, endeavor to make himself master of the details of the position he enters upon.

A straightforward, manly disposition counts for almost more than anything in attaining success in life. Every man having a reputation for integrity, thoroughness, perseverance, and loyalty is eagerly sought after by all employers.

Having determined to enter railway service, there are many avenues which might be followed. If a boy determines that his natural inclination is for mechanics, he might enter as an apprentice and, depending on the trade selected, would in the course of four or five years become a full-fledged mechanic.

Having learned the mechanical trade, if ambitious, he would in a short time be promoted to an assistant foreman, from that to foreman, district master mechanic, master mechanic, superintendent of motive power, and finally general manager, as is witnessed by the career of Mr. Hall, the present General Manager of Western Lines.

Now, it would naturally occur to you that while there are thousands of mechanics, there is only one general manager, but it must be remembered that there are a great many foremen, assistant foremen, master mechanics, etc., and that a number of men having reached the position of tradesman are satisfied to remain there, because, following the lines of least resistance, it is easier to be free of responsibility at the end of the day's work rather than to attend night school and study with a view to fitting oneself for the higher positions.

If engineering appeals to a boy, and his parents are not in a position to afford a regular college course, he might enter the service as a rodman, at a salary of forty dollars per month and his board, and work up to the position of civil engineer, studying mathematics and engineering generally in his spare time, so that his actual and technical experience would in time fit him for the position he was aiming at. Once having become a civil engineer, every position on a railway is open to him.

If the train service appeals to him, he might enter the yard office in a clerical capacity until he was twenty-one years of age, when he could adopt yard or train work, beginning as a brakesman. The wonderful growth of Canada is such that the number of men in train service will be continually added to, and as the Canadian Pacific Railway follows the practice of promoting its own men, it would be only three years, or four at the outside, before he would be promoted to the position of freight train conductor, or, if he entered the yard service, the position of yardmaster. Having arrived at the position of yardmaster or trainmaster, every position in the railway service is within his reach.

If a boy prefers an outdoor life entirely and thought of entering the maintenance of way department when becoming full grown, he could enter the service as a section man and quickly be promoted to section foreman, and if he studied, was observant, and fitted himself, would quickly be promoted to the position of roadmaster, or, if he entered as a carpenter, might find himself promoted to the position of bridge and building master.

If instead of an outdoor life he preferred indoor work, there are two channels by which he might enter. He could either fit himself as a stenographer or enter as an agent's assistant and learn telegraphy. If he determines that he has a natural aptitude for clerical work, having perfected himself in stenography, he would have no trouble in securing a position in the railway service. Once having secured a position as a stenographer, if he studied and determined to succeed, his promotion in the West, where the growth is so great at the present time, would be very fast. Having entered the service as a stenographer, if he had a good address, became proficient in taking notes and transcribing them accurately, he would very quickly be picked up as secretary to some officer, and in that position he would learn the details of the work of administrative duties, and quickly fit himself for an official position, his ability, honesty, perseverance, and personality being the only limit to his advancement.

Should he determine to climb the ladder through the station service, he would begin work as a station assistant. During his spare hours he would learn telegraphy, and inside of a year from entering the service, he would be fitted to take a small office as operator. From that he would in turn be promoted to a station agency at a small station, then advance to the larger stations, and, if he displayed the necessary qualifications, would be picked up and placed in the traffic department, beginning as a traveler and winding up as a chief officer.

Or if the transportation side appealed to him more than the commercial, he would in time be transferred from station agent to the position of train dispatcher, and from that to chief train dispatcher, trainmaster, superintendent, and so on.

It will naturally be said that there are few official positions and that the opportunities are few and far between for advancement. I would point out, however, that the President of our Company, Sir Thomas G. Shaughnessy, began work as a clerk in the Stores Department, that the General Manager of Western Lines, Mr. Hall, began his career as a machinist's apprentice. We have four General Superintendents: Mr. Coleman, who has just recently been appointed in charge of the Manitoba Division, began as a stenographer, and his salary twelve years ago was $40 per month. The General Superintendent of the Saskatchewan Division began as a clerk in the Mechanical Department. The General Superintendent of the Alberta Division began as a telegraph operator. The General Superintendent of the British Columbia Division began as a clerk. Every officer on the Canadian Pacific Railway began in the service in a junior position and worked his way to his present position.

It will probably surprise you to know that I am continually looking around for officers and that most of the other Western Railways are doing the same thing. If there is a vacancy for a superintendent, for instance, a list of all the trainmasters, district master mechanics, roadmasters, chief train dispatchers and chief clerks is made out, with their age, the date they entered the service, etc. This list is then gone over with a view to determining which would be the most suitable man for the position.

First, the characters of the different men are discussed and those who are known to be lacking in courtesy are struck off the list. Of the remainder, it is determined that some have not endeavored to fit themselves for promotion to the vacant position, not having improved on earlier defects in education, and their names have to go by the board. Of the names left, it is found that some are lacking in the moral courage necessary to handle large bodies of men, or are without initiative, resourcefulness, or are lacking in ambition, and their names are struck off, so that it finally comes down that there are but a few considered eligible. When it is narrowed down to this, the man who is senior in the service is given the position.

It may be truthfully said that a man's future rests almost entirely with himself. There is no use in denying that luck sometimes enters into a man's success, but I am not much of a believer in luck, because opportunity, in the West at any rate, will come to all boys, and those who have fitted themselves to take advantage of the opportunity that presents itself will be thought to be lucky.

I think that all boys should stay at school until they are well grounded. It is, of course, to be expected that through unfortunate circumstances some boys will have to leave school earlier than is good for them—too early to receive a good grounding, but then these boys who are so unfortunately placed should take advantage of their spare hours to make up for the loss in their education from having been compelled to leave school too early.

The world is certainly becoming better all the time, and the relations generally between men and their employers are better than ever before.

## THE LITHOGRAPHING TRADE

W. J. BULMAN
Of Bulman Bros., Ltd., Winnipeg, President of the Winnipeg Industrial Bureau

Now, boys, I want to tell you about a business that depends upon something which was known from the beginning of the world but was never applied to printing until the year 1789. You all know grease and water will not mix, don't you? Well now, just because they don't mix, lithographers can make the colored pictures you see and a great many other forms of printing which you would never guess depend entirely upon that one fact. Don't you think it strange that thousands of years should elapse, and millions of men live and pass away with this fact known to them, and yet the great industry of lithography had to wait for a German named Aloys Sennefelder to discover how to use it, and while improvements in machinery and methods have taken place, still the great idea of how to use the fact was his? And, boys, upon just such little facts most of the great industries find their base, and maybe some one of you when you grow up will adopt some little truth you learn and discover an invention upon which some great industry employing thousands of men will grow up, and the world be richer for your having lived. I have brought with me a little piece of what we call lithographic stone. It is a limestone and is found in Bavaria. This stone is of a fine grain, and if you put grease upon it, it is able to absorb enough of it to make a greasy spot, and then if water is put upon it, it also absorbs a little of that where it is not greasy. Now, you can imagine what takes place. Here is a greasy line, the rest of the stone is damped with water and we take a roller covered with printing ink and roll it over the stone; what happens is this: the ink being of a greasy nature adheres to the greasy line but will not stick to the damp parts of the stone because the water is there. The part of the roller which touches the line gives up some of its ink, but on the part which touches the damp places, the water comes between and the ink does not dirty the stone, it just stays on the roller. Now, the line having ink on it, it only remains to put paper on that and something to squeeze it down hard, and when we lift it off there is a print of the line on the paper. That is the process. But, boys, it takes great skill to take greasy ink and draw beautiful things on the stone, so it is hard to get lithographic artists. That is a trade by itself, and if you ever learn to be a lithographic artist you can be certain that if you are very skilful every employer in the land will try to obtain your services, and you can command a very good salary. But if you are an ordinary workman you will get about $20.00 per week and if you are a poor one you will not get any more than you could earn with a pick and shovel. The same is true of the engravers, the men who with a tool, very like a lead pencil, but having steel instead of the lead, cut lines, etc., into the stone's surface, and fill them in with ink. This is the way all the finest stationery is printed. In this art there is a very great demand for good men and they are as well paid as the artists; but again if you are only an incapable workman the result is "pick-and-shovel" wages. The same is true in every department of lithography, and, boys, when you grow up you will learn it to be true of every trade or calling. Whether you can make life pleasant and comfortable not only for yourself, but for all that may depend upon you, depends right now upon your earnest effort to study, and a little later, on choosing a calling and then applying what you have learned, giving your whole self to your work. If you do this, your reward is sure.

I am very anxious that you will grow up earnest workers to make this, your home city, famous as the place where the best workmen are found. It can be done only by forming the habit of being perfect in your work. Remember that you will commit the greatest crime possible if you leave school too soon, for you then kill your own possible future. Think of what must be learned in this trade. Every engraver ought to know enough geometry to make the perspective correct when he has to engrave a building or other picture. Every artist must also have some knowledge of geometry, and if he is to be a superior workman he should read a great deal to gather ideas and fit himself to apply suitable designs to all sorts of business. The man who prints what the artist draws should have a knowledge of chemistry, an understanding of mechanics to take care of his machine, and a knowledge of color mixing. Then there is a trade we call that of the transferrer. He is a man that can take prints from the artists' and engravers' work and transfer them to another stone. I will show you a sheet of labels. You see the artist drew only one label, but the transferrer has made a great many prints of that and stuck his prints upon a sheet of paper in the form required to fill this large sheet. He then turned them face down onto a clean stone and applied pressure, so transferring the wet ink to the new stone. After preparing it is then printed by the printers as you see it.

I will explain how the printing of colored pictures is done. The artist first paints a picture complete, which is submitted to the man who wants to buy such a picture. After the buyer approves of it, the artist lays upon the painting a sheet of transparent gelatine and traces with a sharp point an outline, the point making a scratch in the gelatine. This scratch is then filled in with ink by the transferrer and the gelatine is damped, then squeezed upon a stone so as to transfer the outline. This outline is then printed on a few sheets of paper and while the ink is wet a red chalk is dusted over it; this sticks only to the wet ink and is shaken off every other part of the paper. Next these sheets are placed each upon a clean stone and squeezed so as to make a chalk mark of the outline, and these stones are given to the artist, who proceeds to draw carefully to these outlines all the yellow there is in the picture, like the sheet I am showing you, then he draws all the red on another stone, all the blue on another until he has all the colors needed to perfect this picture and make it just like the original painting. The printer prints from these stones one at a time, namely, all the yellow first, the red next, and so on. You remember what I said before about grease and water; well, the presses have flannel rollers which are kept damp and they run over the stone, then after these, rollers covered with leather and the leather covered with printing ink also run over the stone. The water not going where the greasy design is, and the ink not going where the water is, leaves it so that when the work is all inked, a cylinder pressing a sheet of paper on the stone makes the ink mark the paper as you see. It is very simple, but, boys, most things men work at are simple, that is, each operation is a simple one. Men grow up from boys and, strange to say, they don't change much. It only seems that the able, useful, and successful men are boys that are willing to plug hard and work hard practicing, who are not soft-headed enough to let fun and pleasure take all the time, but study hard and work earnestly at whatever they undertake. The Bible says "Whatever your hands find to do, do it with your might." That is the key to success today, and remember, boys, you have not only to use your might of muscle, but the more important might of brain; for it is of little use to have the muscular power of an elephant, but of tremendous use to have the power of mind of a Newton. This immensely valuable faculty of mind you are cultivating in school and as your time is short, your teachers are trying to give you the keys to many departments of knowledge, so that you can use them in after life and get at what you want to make success. I have one thought I want you to remember: Without knowledge you cannot be a good workman, and if you are not a good workman, you and all depending upon you are condemned to that horrible life of the inefficient, filled with unspeakable irritations and despair.